Educational Technology Standards

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DEPARTMENT OF EDUCATION
Learning. Leadership. Service.

South Dakota
K-12 Educational

Technology Content Standards

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INTRODUCTION

Guiding Concepts

The Educational Technology Standards Committee developed these standards based on several concepts that teachers and students of Educational Technology should keep in mind during the learning process:

- Information and communication technology (ICT) is an important context of technology and it supports every subject area. Access to and application of ICT, through Educational Technology offerings,are opportunities that should be available to every South Dakota student.
- Technology is a human process; it is more about with what people “do” than with what devices are used. ICT education should focus more on how students learn to communicate to different audiences and less on the specific operations of computers and networks.
- ICT is one of several important contributors to the technological literacy of students. Technological literacy is a broad concept that includes the abilities to understand, to know, to think, to do, to assess, to transfer knowledge, skills, and attitudes to the world around us.
- ICT is one of several important components of the educational technological literacy of students. Technological literacy is a broad concept that includes the ability to use, manage, assess, and understand technology. See glossary for more detail.
- Technologists are essentially problem solvers. Students of every technology should learn, develop, and apply problem-solving skills through problem-based learning

opportunities.

- All technologies operate within an environment called a system. Students of technology should explore the concept of “systems thinking” so they can develop a context for their learning and their work. If the students can conceptualize their work in terms of an uniform, but adaptable, system, they may be better equipped to adapt to changes in technology and the world around them
- Technology follows a common methodology known as the design process. This is a problem-solving method includes stages of problem definition, the exploration of alternative solutions, the optimization of a chosen solution, and the development of a final outcome. Technology students should develop their ability to apply the technological method much the same as Science students learn to apply the scientific method.
- Technology is closely linked to creativity and innovation. Educational Technology presents boundless opportunities to students to produce creative works in text, images, graphics, and media.
- Technology should be made relevant to students. The application of technology to everyday life and to other technologies should be emphasized (or made clear) to students during the teaching and learning process. The relevance of technology to career opportunities and to the workplace should be communicated as a part of instruction.
- Technology tools and processes are constantly changing and emerging. For this reason, teachers should strive to be current with the constantly emerging advances in technology and flexible in adapting their teaching to these new advances. In this context, teachers need to take advantage of the teachable moments that evolving technologies and current events provide.
- Technology is an active process. Laboratory opportunities

for learning about, for using, and for applying Educational Technology should be universally available to every South Dakota student.

- Teaching and learning in a standards-based system is not a textbook-driven process. Textbooks are tools that, when used appropriately, enhance teaching and learning by providing instructional materials relevant to the specified standards.
- While standards are the core that all students should learn and master, teachers will expand upon these standards and introduce related topics to students in the course of instruction. **Teachers who teach classes in the specific areas of technology (i.e. Technology Education or Computer Applications) will build on the foundational concept of these standards.**

FORMAT OF THE STANDARDS DOCUMENT

Standards

The standards are the targets all students need to meet at the proficient level by the end of each grade level. The standards will be presented in two formats. The first format organizes the standards by grade level so a student, parent, classroom teacher, administrator, or local school board member can quickly review what learning is expected at each specific grade. The Bloom's Taxonomy level of cognitive challenge is listed in the standard document to make clear the level at which each standard should be assessed.

All standards in each grade level need to be met at the proficient level by the time students are tested for these skills on the state assessments. For early grades not

assessed on the state assessments, students need to master the standards at each grade level in order to be adequately prepared to meet the next grade-level standards and subsequently, to achieve the proficient level at the grade levels tested.

The standards are also provided in a side-by-side format so the alignment of standards from grade-to-grade is immediately apparent. This section of the document contains content strands, indicators, grade-level standards and supporting skills, and examples. Each has a role in shaping the expected outcomes for South Dakota students.

- **Strands** are the broad conceptual content areas that define Educational Technology. They are: Nature, Concepts and Systems (systems thinking, interactions, and design), Social Interactions, Information and Communication Tools, Information and Communication Processes, and Information Literacy.
- **Indicators** are the common threads of a strand that represent expected outcomes for all students preparing to graduate from South Dakota schools.
- **Grade-level Standards and supporting skills** represent expected outcomes for students completing each grade level.
- **Examples** represent some possible materials and/or activities classroom instructors could use in teaching the standards or supporting skills. Examples are not provided where the meaning of the standard should be evident to the reader. While the intention of providing examples is to clarify what is intended in terms of the complexity and level of challenge of the standard, these examples do not represent actual test items that will appear on the assessment.

Performance Descriptors

The performance descriptors are organized into proficiency levels. These proficiency levels describe the content and processes that a student at a given proficiency level would be expected to know, demonstrate, or perform. To identify increasing proficiency educational technology, the levels are labeled as follows:

- **Advanced:** A student performing at the advanced level exceeds expectations for that grade level. The student is able to perform the content standards for the grade at a high level of difficulty, complexity, or fluency beyond that specified by the grade-level standards.
- **Proficient:** A student performing at the proficient level meets expectations for that grade level. The student is able to perform the content standards for the grade at the level of difficulty, complexity, or fluency specified by the grade level standards.
- **Basic:** A student performing at the basic level performs below expectations for that grade level. The student is able to perform some of the content standards for the grade below the level of difficulty, complexity, or fluency specified by the grade-level standards.

A student performing below the basic level is unable to perform the content standards for the grade. Therefore, no description is provided below the basic level.

ADDITIONAL RESOURCES

Since this document uses appropriate educational technology terminology, a reader may occasionally encounter an unfamiliar term. In order to assist the reader with

terminology used in the document, a glossary has been included with specific definitions to clarify intended meaning.

A MESSAGE TO TEACHERS, PRINCIPALS, SUPERINTENDENTS, AND OTHERS WHO WILL USE THE DOCUMENT

The Educational Technology Standards Committee was made up of a group of K-12 teachers and technology coordinators who collaborated to establish a starting point for reaching South Dakota's goal: every student performing to at least the proficient level for each grade level standard.

A set of standards is simply a place to begin—it lays the foundation for measurable, consistent, high-level student learning; however, teachers must consider the needs of their individual students and select the methods that will work best for their classrooms. Examples and lists of supporting skills have been provided to clarify but not limit the meaning of the standards. ***The curriculum of each district must provide students with rigor and topics beyond those of the standards in order to ensure mastery.***

Clearly, there is more to teaching and learning than these standards. Adjustments will need to be made for those students who exceed the standards and for those who cannot easily meet them. The standards are a starting point in creating an environment where students can learn to live and thrive in a constantly changing, increasingly complex world.

Technology is an extremely large field that has many, many sub-disciplines. As a result, when educators talk about technology, there must be a clear understanding of what, exactly, is being discussed. These Educational Technology

Content Standards relate to the topics of technology that are related to electronic and graphical communications, to general computer operations, to network telecommunications operation, and the use and assessment of information.

Other, more specialized, technology topics can be found in the content standards for Technology Education, Science, Mathematics, Social Studies, and Career & Technical Education courses. Those standards contribute significantly and should be thought of as strong allies as work proceeds toward the goal of Technological Literacy among South Dakota's students. Some examples of specific topics from other fields that support technological literacy are:

- Data communications in automated manufacturing
- Global positioning systems (GPS) in agricultural and social studies mapping
- 3D design in building construction
- Real-time data collection in biological sciences
- Data analysis using graphing calculators and statistical software in Mathematics
- Terrain sensing in transportation systems
- Power demand monitoring in alternative energy systems
- Robotics; an interdisciplinary blend of controller programming, sensor communications, systems engineering, materials selection, and fabrication.

IMPORTANT NOTE TO TEACHERS: Not every supporting skill presented in this document needs to be taught in order for students to master the associated standard. This is also true for the examples that appear in this document. Supporting skills and examples are provided only to illustrate the standard and are not designed as requirements to be taught.

CONCLUSION

Technological literacy is a goal that is an essential component for all of the citizens of South Dakota. It will ensure that students become successful learners able to contribute to the economic and social development of our state. These Educational Technology Content Standards, combined with content standards in other areas of technology and other academic subjects, will prepare students to be knowledgeable and adaptable as they pursue their lifelong goals.

Introductory Paragraphs for the Strands

Educational Technology Content Standards

Strand #1 - Nature, Concepts and Systems
(systems thinking, interactions, and design)

Rationale:

It is common to think of technology as a device or a thing. However, it may be beneficial to describe it as the process of using tools and knowledge to interact with the world around us. In that larger sense, technology can also be thought of as a tool that extends human capability: “know how.” From this viewpoint we see that technology is a very broad discipline. Information and Communication Technology (ICT) is merely one of several contexts within that broad field of technology.

This Nature, Concepts and Systems (systems thinking, interactions, and design) strand emphasizes the general processes that describe how people “DO” technology. The subsequent strands focus specifically on ICT.

Because it uses creative ideas and is closely related to scientific principles, technology often changes. It is,

therefore, important for citizens to understand the history and contributions of technology over time. They should also be aware of how technology utilizes knowledge from other fields as well as how it contributes to those fields.

Technology operates within a system and a system can be defined as a combination of parts that work together for a purpose. These Educational Technology Content Standards utilize a systems approach because it is an effective way to organize knowledge and skills for easier understanding. When citizens learn to think in terms of systems they enhance their ability to function in a rapidly-changing world.

Technology is a process that often incorporates systematic problem-solving and design methods. It is a sequence that begins with the definition of the problem at hand. Next, information is gathered and alternative solutions for the problem are proposed. The best solution is selected from the alternatives, then developed and produced into a result. The result is tested and evaluated to determine if it, in fact, solved the problem. The final stage of the process involves sharing the results with others.

This last step is important for the development of human experience and for contribution to a shared knowledge base for society.

Indicators:

Indicator 1: Students understand the history and progression of technology in relation to the development and design of future technology.

Indicator 2: Students analyze the parts of a technological system in terms of input, process, output, and feedback.

Indicator 3: Students analyze the relationships and the connections between technologies in different fields of study and how they apply to communities.

Indicator 4: Students understand the purpose and demonstrate the use of the design process in problem solving.

Strand #2 - Social Interactions in Information & Communication Technology

Rationale:

When people communicate and work with information, the activities are often interpersonal and intercultural. This strand addresses the needs for students to develop awareness and skills that relate to privacy and ethical issues.

Citizens must also deal with consumer issues relating to ICT. For that reason citizens need to develop skills on how to select technologies.

Indicators:

Indicator 1: Students understand the safe, ethical, legal, and societal issues related to technology.

Indicator 2: Students investigate the advantages and disadvantages of technology.

Strand #3 - Information & Communication Technology Tools

Rationale:

There is a dizzying array of ICT tools available to people today. In this strand, students learn about selecting ICT tools that are appropriate for the need at hand. In addition, they will learn the necessary skills to be effective users of the tools.

Initially, the reader of these standards may note the lack of a list of equipment, software, hardware, and devices the students will learn to operate. This lack of a list is intentional because new products become available faster that any document can reflect.

Instead, students will be learning to select and operate tools that are available and appropriate for the situation

at hand.

Indicators:

Indicator 1: Students recognize and demonstrate skills in operating technological systems.

Indicator 2: Students use technology to enhance learning, extend capability, and promote creativity.

Indicator 3: Students evaluate and select information tools based on the appropriateness to specific tasks

Strand #4 - Information & Communication Technology Processes

Rationale:

The processes of communicating and dealing with information are as diverse as the population and as broad as the variety of ICT tools. As in the previous strand, the reader will notice that there is no exhaustive list of processes that the students will complete. Instead, students will develop process skills that are appropriate for the learning situation at hand. Those situations are to be based on resources available to the students at the time.

Indicators:

Indicator 1: Students understand the purpose of information technologies to communicate with a variety of collaborators.

Indicator 2: Students exchange information and ideas for an identified purpose through Information Technologies.

Strand #5 - Information Literacy

Rationale:

The International ICT Literacy Panel suggests that ICT literacy be represented by a continuum of knowledge and skills with increasing complexity. This Panel, composed of educators, technology experts, scholars, and industry representatives from around the world, has agreed on the following sequence:

Access - knowing about and knowing how to retrieve information

Manage - applying an existing organizational scheme

Integrate - interpreting and representing information; (summarize, compare, contrast)

Evaluate - make judgments about quality, relevance, usefulness, and efficiency

Create - generate information by adapting, applying, designing, or authoring

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Indicators:

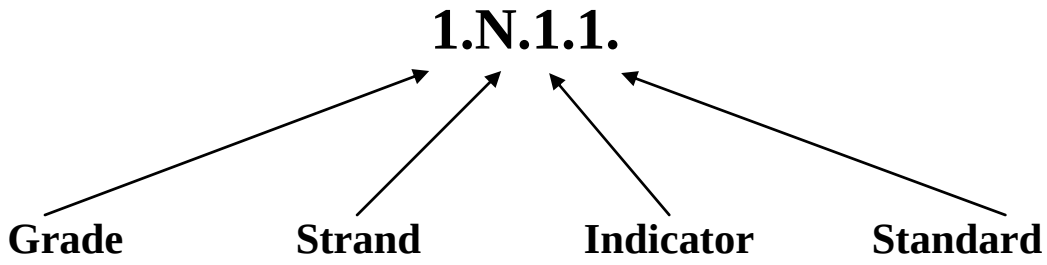
Indicator 1: Students use technology to locate and acquire information.

Indicator 2: Students determine the reliability and relevancy of Information

Guide to the Numbering and Symbol System

Used in the Document

Standards are coded to cross-reference grades, goals/strands, indicators, and standards.



Grade refers to the grade level at which the standards are to be mastered by students.

Strand refers to the major area of Technology (e.g., Nature and Concepts, Social Interactions, Information Literacy) this group of standards address. These strands are coded:

NC for Nature and Concepts of Technology

SI for Social Interactions

CT for Information and Communication Tools

CP for Information and Communication Processes

IF for Information Literacy and Decision Making

Indicator refers to the number of the indicator for this strand. Each strand has one or more related indicators that describe key aspects of the strand.

Standard refers to the number of the grade-level standard for the indicator. Each indicator has one or more grade-level standard(s) that describes what students will know and be able to do related to the indicator at the specific grade level.

Examples in bold type are directly related and aligned to the level of the standard. These examples represent the level of difficulty intended in the grade-level standard and possible materials, activities, or sub-skills classroom instructors could use in teaching the standards.

Grade-level supporting skills represent enabling skills students may need to be taught in order to achieve the standards.

(•) Bullets represent enabling skills to the current grade-level standard students may need to be taught in order to achieve the standards.

(√) Checkmarks are enabling skills to the next higher grade-level standards that are related to current grade-level standards and thus may be introduced at an earlier time.

Examples that are NOT in bold type are related and aligned to the level of the bullets/supporting skills and checkmarks. These examples represent the level of difficulty intended in the grade-level standard. They represent some possible materials, activities, or sub-skills classroom instructors could use in teaching the supporting skills.